HEALTH INEQUALITIES CASE STUDIES

GREEN MOBILITY AND CLIMATE JUSTICE: THE CASE OF ROTTERDAM, THE NETHERLANDS

DECEMBER 2021

european public health alliance

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About EPHA's Health Inequalities Advocacy

We stand against discrimination, for inclusion and equal opportunities for all to live, work and age in sustainable, healthy environments. EPHA has called on researchers and policy analysts to submit research articles to help build knowledge about how the health of disadvantaged groups is affected by inequalities in areas such as employment, housing, education, healthcare, environment, and climate.

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Co-funded by the Health Programme of the European Union

The European Public Health Alliance has received funding under anoperating grant from the European Union's Health Programme (2014-2020). The content of this document represents the views of the authors only and is their sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the European Health and Digital Executive Agency (HaDEA) or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.

Transparency Register Number: 18941013532-08

Executive Summary

Climate change is the biggest global health threat of this century, imposing major negative health consequences for people, especially those from disadvantaged communities. The European Commission recently adopted a set of proposals within the framework of the European Green Deal to meet its climate goals. To mitigate climate change, reducing air pollution is essential. As people with low socioeconomic status are often asked to make the biggest sacrifice, we aimed to show the case of Rotterdam's green transport inclusivity by combining data on the number of public transport stops and registered cars in the city's neighbourhoods with the social score of those neighbourhoods.

Our findings showed that the higher the social score of a neighbourhood, the lower the number of public transport stops and the higher the number of cars per household. This resulted in four policy recommendations:

(1) Address low green transport use in neighbourhoods with a high social score;
(2) Implement proportional financial penalties for non-electric car use;
(3) Make public transport accessible for all;
(4) Exchange good practices with other cities.

These steps are needed to enhance the climate agenda at the local level. We argue that these recommendations are also relevant for the EU's agendas on NCDs prevention, economic development and urban planning.

Introduction

Human-induced climate change is threatening the progress of reaching the Sustainable Development Goals 2030 agenda. Any increase in global warming leads to negative impacts on human health: directly through its effects on the social and environmental determinants of health and indirectly through broader socio-political consequences of climate change (e.g., migration and conflicts).[1] Disadvantaged groups in society (e.g. minorities and poor populations) suffer disproportionately from the adverse health impacts of climate change due to a diminished ability to cope with and recover from the damage suffered from climate events.[2] The resulting widening of health inequalities in the European region re-emphasises that action towards the climate crisis is needed now.[3,4] Simultaneously, climate action itself can deepen the societal divide by the unequal distribution of benefits and damages; people with lower socioeconomic status are asked to make the biggest sacrifices (e.g., financial penalties for private car use and carbon pricing).[5] Climate mitigation and adaptation policies should therefore make sure to leave no one behind.

Recently, the European Commission adopted a set of proposals to transform the EU economy and society to meet climate ambitions. This includes making the EU's climate, energy, transport and taxation policies fit for reducing greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.[6] A key deliverable is reducing premature deaths caused by air pollution, a driver of climate change, by 55%.[7] Achieving these reductions in the next decade is crucial to Europe becoming the first climate-neutral continent by 2050.[8]

1 World Health Organization. (2018). COP24 Special Report: Health and Climate Change; World Health Organization: Geneva, Switzerland.

2 Islam, S.N. & Winkel, J. (2017). Climate Change and Social Inequality. Working Papers 152, United Nations, Department of Economics and Social Affairs.

3 European Environment Agency. The European environment — State and outlook 2020. In Knowledge for Transition to a Sustainable Europe; Publications Office of the European Union: Luxembourg, 2019.

4 Graham, J. (2021). Climate change will deepen rich-poor global divide, top economists warn. Retrieved 6 August 2021, from https://www.reuters.com/article/us-global-climatechange-in-equality-trfn-idUSKBN2BM09Z

5 Markkanen, S. & Anger-Kraavi, A. (2019). Social impacts of climate change mitigation policies and their implications for inequality. Climate Policy, 19(7), 827-844. doi: 10.1080/14693062.2019.1596873

6 Delivering the European Green Deal. (2021). Retrieved 6 August 2021, from https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

7 European Commission: Zero pollution action plan. (2021). Retrieved 6 August 2021, from https://ec.europa.eu/environment/strategy/zero-pollution-action-plan_en

8 European Commission, Delivering the European Green Deal.

Many major European cities have started to develop climate mitigation and adaptation policies at the local level. In Rotterdam, the Netherlands, the municipality initiated the Climate Alliance in which local policymakers, industry and other stakeholders come together to set steps in several themes: port and industry, built environment, mobility, green energy and consumption. Among others, this alliance aims to achieve carbon-neutral, healthy, inclusive and affordable mobility by 2030. Improving public transport, reducing car traffic, and increasing electronic car use and shared transport are the means to this end.[9] The main operator of public transport in the region, RET, also formulated climate goals. The company aims to be *energy positive* in 2030, which translates to more energy being generated than used. In 2019, the first 55 fully electric busses were incorporated in Rotterdam. The goal for 2030 is to contain a 100% zero-emission bus fleet and in the transition period, they aim to use hybrid busses.[10]

Methodology

This case study focuses on the inclusivity of green transport in Rotterdam. Using databases on urban planning and social scores, the availability of current green transport was mapped according to neighbourhoods with a low, middle or high social score. The social score was defined by the education, income and labour market position of residents. Study results by the academic collaborating Centre for Effective Public Health In the larger Rotterdam area (CEPHIR)[11] were used to inform the social score of Rotterdam's neighbourhoods.[12] Transport was mapped through the number of public transport stops (metro, bus and tram) in the different neighbourhoods of the city. Due to data unavailability, the number of registered cars per household was used instead of electric cars. Data was retrieved from RET[13] and De Klimaatmonitor[14]. Additionally, a rapid policy analysis was conducted to gain insight into the relation with Rotterdam's climate ambitions.

9 Energieswitch Rotterdamse Klimaat Alliantie. (2019). Rotterdams Klimaatakkoord.

10 RET, Milieu, https://corporate.ret.nl/mvo/milieu

11 CEPHIR is the acronym of 'Centre for Effective Public Health In the larger Rotterdam area' and is a collaboration between the Department of Public Health of the Erasmus Medical Centre, the city of Rotterdam and the three municipal health services in the wider region.

12 Mölenberg et al. (2019). Is Rotterdam een fastfoodparadijs? De voedselomgeving van 2004 tot 2018.

13 RET is the main operator for public transport in the region of Rotterdam. Data was retrieved from: https://www.ret.nl/home/reizen/kaarten-plattegronden.html

14 'De Klimaatmonitor' (The Climate Monitor) is an initiative of the Ministry of Infrastructure and Water Management. Data was retrieved from: https://klimaatmonitor.databank.nl/dashboard/dashboard/mobiliteit

Discussion

Main Findings

Our findings are two-fold: on the one hand, data on the number of public transport stops show that Rotterdam, in general, offers plenty of access to the metro, bus or tram in nearly all neighbourhoods. On the other hand, our results show that the access is not equally distributed among the city's neighbourhoods. There is a clear link between the social score of neighbourhoods, the number of public transport stops and the number of registered cars per household (Tables 1 and 2). The neighbourhoods with a low social scoring occupy the most stops while having the lowest number of registered cars per household. Conversely, the neighbourhoods with the high social scoring and the city centre encompass low number of stops, while possessing high number of registered cars per household. The neighbourhoods classified with an average scoring, are positioned in between these numbers of the high and low scored neighbourhoods. The high average of registered cars in the city centre can be explained by skewing due to the exceptional high number of one neighbourhood (Dijkzigt). When this neighbourhood is left out, the average is 0.64, and therewith much closer to the number in neighbourhoods with an average scoring. Recently, the municipality of Rotterdam has been constructing more space for cyclists and pedestrians in the city centre, as well as making it less attractive for cars to drive through the centre.[15] It is also a smaller zone compared to the other areas, hence the low number of public transport stops.

1) Policy Recommendation: Address low green transport use in neighbourhoods with a high social score

Our findings expose several implications that can be made regarding green mobility and social inequality. The first policy recommendation follows from the finding that neighbourhoods with a high social score occupy a low number of public transport stops. To increase the use of public transport in neighbourhoods with a high social score, we recommend to:

(1) address the low number of public transport stops in neighbourhoods with high social scores;
(2) promote the use of public transport to these neighbourhoods' households; and
(3) disincentivise the use of non-electric cars to these neighbourhood households.

15 Gemeente Rotterdam, 2020, Rotterdamse MobiliteitsAanpak

The number of public transport stops needs to be increased to give people the comfortable option and means to use public transport. Public transport stops should be scattered around the areas to provide equal access to public transport. In addition, the municipality should start campaigns for increasing awareness about the importance of using sustainable means of transport and how using public transport is beneficial for the environment. Campaigns are generally an effective way to change behaviour among groups with a higher socioeconomic status.

Increasing the use of public transport aligns well with the city's goals; regarding stops, Rotterdam's budget from 2020 for sustainable traffic aims to extend and improve public transport stops, as well as provide better access with high quality.[16] Although this policy recommendation is to be implemented at the local level, we believe that European coordination is needed to improve best practices exchange between cities and to increase the political willingness of Member States.

2) Policy Recommendation: Implement proportional financial penalties for non-electric car use

In Rotterdam, non-electric car possession has increased over the years. In 2016, 34% of residents from Rotterdam possessed a car and 68% were part of a household with a car, summing up to 216,050 cars. In 2020, these percentages were 36% and 71% respectively, which means that 234,230 cars were registered. This translates to an increase of 18,180 cars in a period of five years. Although the number of electric cars also increased over the years (from 1,349 in 2016 to 5,394 in 2020), this shows a worrying trend in the city.[17]

Our findings show that car possession occurs more in neighbourhoods with a higher social score. To decrease the possession of non-electric cars, we recommend to:

(1) implement financial mechanisms that encourage uptake of green modes of transportation, such as:
    a. penalties or additional taxes for the use of non-electric cars;
    b. increasing subsidies for the acquisition of electric cars and a similar amount for second-hand electric cars;
    c. offering subsidies for electric cars until the city achieves their climate goal of being carbon-neutral;
    d. subsidies or additional remuneration for the use of public transport;
(2) ensure the equitable implementation of these recommendations by basing the penalties, taxes or subsidies on household income. The calculation should not be neighbourhood-bound; only those with the means to pay should pay, and those who need the financial support more should get it in a higher amount.

16 Verkeer en vervoer - Ontwikkeling. Available online: https://www.watdoetdegemeente.rotterdam.nl/begroting2020/programmas/verkeer-en-vervoer/verkeer-en-vervoer-ontwik/

17 De Klimaatmonitor, https://klimaatmonitor.databank.nl/dashboard/dashboard/mobiliteit

This policy recommendation – albeit focused on Rotterdam specifically – can be applicable to an array of other cities across Europe. The 2020 report led by the European Public Health Alliance showed the health--related social costs of air pollution in 432 European cities. The total social costs were over € 166 billion in 2018. As the report states, "in absolute terms, London is the city with the highest [health-related] social costs. In 2018, the loss in welfare for its 8.8 million inhabitants totalled € 11.38 billion". Rotterdam is well below this number, with € 750,342,591 in total costs. However, Rotterdam's damage per capita is € 1,213 (3.1% of the GDP), making the city the number two in the Netherlands and not much less than London with its € 1,294 per capita.[18]

Fortunately, reducing traffic by car and improving public transport is part of the Rotterdam Climate Alliance's extensive list of policy options.[19] This aligns well with the ambitions as stated in the European Green Deal: a transition to greener mobility which will "offer clean, accessible and affordable transport even in the most remote areas".[20] Also, the recent revision of the WHO Global Air Quality Guidelines (AQGs) brought a lot of attention globally to the need for reducing levels of air pollutants and therewith, decreasing the disease burden resulting from exposure to air pollution. The AQGs "provide clear evidence of the damage air pollution inflicts on human health, at even lower concentrations than previously understood". Therefore, the WHO recommended new air quality levels, which all WHO Member States are urged to achieve.[21]

3) Policy Recommendation: Make public transport accessible for all

Furthermore, it needs to be highlighted that a large proportion of the public transport stops are not accessible for people using a wheelchair. In multiple areas, there are several stops with no access for wheelchairs, which means that in some neighbourhoods people with a physical disability cannot use public transport. This creates large inequalities between areas and thus, municipalities should ensure that all stops are accessible for everyone. As a result, everyone can have the possibility to choose a more sustainable option of transport.

18 CE Delft. (2020). Health costs of air pollution in European cities and the linkage with transport.

19 Mobiliteit: Energieswitch Rotterdamse Klimaat Alliantie. (2021). Retrieved 6 August 2021, from https://energieswitch010.nl/klimaattafels/mobiliteit

20 European Commission, Delivering the European Green Deal.

21 New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution. Available online: https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution

4) Policy Recommendation: Exchange good practices with other cities

Our data shows that people in neighbourhoods with a low social score possess fewer cars and have more access to public transport. It is essential that other cities, similarly to Rotterdam, have high availability of stops for people with a low socioeconomic status such that they have the ability to travel to their work, the city centre, healthcare facilities etcetera. Therefore, the city of Rotterdam should exchange good practices with other cities in Europe and beyond. This could increase mental health, social participation in society and can decrease social inequalities and air pollution.[22,23]

22 Djurhuus, S.; Hansen, H.S.; Aadahl, M.; Glümer, C. (2014). The Association between Access to Public Transportation and Self-Reported Active Commuting. Int J Environ Res Public Health; 11(12), 12632–12651, doi: 10.3390/ijerph111212632

23 How transport offers a route to better health. Available online: https://www.health.org.uk/publications/long-reads/how-transport-offers-a-route-to-better-health

Conclusions

Three out of four residents from Rotterdam are worried about the consequences of climate change.[24] Reducing air pollution is key in mitigating the consequences of climate change on health. Inclusive, green transport is needed such that people from all backgrounds can take action.

The case study of Rotterdam shows that the higher the social score of a neighbourhood, the lower the number of public transport stops and the higher the number of cars per household. Increasing the use of green transport, and decreasing the use of non-electric cars, needs to be addressed in neighbourhoods with a high social score. We argue that awareness, but also financial penalties are needed to achieve these goals. Furthermore, our case study shows that public transport is not per se accessible for everyone, specifically to people using a wheelchair. Last, Rotterdam shows a good example for other European cities by offering plenty of access to public transport in general, but also specifically in neighbourhoods with a low social score.

These policy recommendations touch on multiple policy areas that are relevant for the Commission: climate policies, NCDs prevention (including cancer prevention), economic development (making the right investments at the right time), and urban planning. The case of Rotterdam could serve as an example for other European cities where air pollution, green mobility and health inequalities are major contemporary challenges.

24 Energieswitch, Rotterdams Klimaatakkoord.

Annex

Table 1. Average of the number of registered cars and sum of the number of public transport stops per household per neighbourhood class.

Neighbourhood class	Registered cars per household	Public transport stops
City centre	1.11	40
Low social score	0.58	152
Average social score	0.62	138
High social score	0.81	112

Table 2. Average of the number of registered cars and sum of the number of public transport stops per household per neighbourhood.

Neighbourhood	Registered cars per household	Public transport stops
's Gravenland	1.04	5
Afrikaanderwijk	0.49	7
Agniesebuurt	0.49	5
Bergpolder	0.45	1
Beverwaard	0.8	10
Blijdorp	0.55	8
Bloemhof	0.56	9
Bospolder	0.47	2
C.S. kwartier	0.57	3
Carnisse	0.44	4
Cool	0.74	5
De Esch	0.69	2
Delfshaven	0.4	4
Dijkzigt	3.92	4
Feijenoord	0.5	10
Groot Ijsselmonde	0.72	25
Heijplaat	0.84	6
Het Lage Land	0.7	8
Hillegersberg Noord	0.9	6
Hillegersberg Zuid	0.8	6
Hillesluis	0.61	10
Katendrecht	0.64	7
Kleinpolder	0.72	11
Kop van Zuid	0.71	3
Kop van Zuid - Entrepot	0.63	6
Kralingen Oost	0.63	8

Kralingen West	0.47	5
Kralingseveer	0.95	5
Liskwartier	0.56	2
Lombardijen	0.66	17
Middelland	0.46	10
Molenlaankwartier	1.12	5
Nesselande	1.16	6
Nieuw Crooswijk	0.59	4
Nieuwe Werk	0.79	5
Nieuwe Westen	0.5	12
Noordereiland	0.6	8
Ommoord	0.76	12
Oosterflank	0.67	7
Oud Charlois	0.62	13
Oud Crooswijk	0.5	9
Oud Ijsselmonde	1.04	9
Oud Mathenesse	0.52	5
Oude Noorden	0.49	4
Oude Westen	0.45	11
Overschie	0.95	12
Pendrecht	0.65	10
Prinsenland	0.79	8
Provenierswijk	0.43	7
Rubroek	0.43	5
Schiebroek	0.69	12
Schiemond	0.69	0
Spangen	0.59	5
Stadsdriehoek	0.59	9
Struisenburg	0.43	4
Tarwewijk	0.54	3
Terbregge	1.19	3
Tussendijken	0.47	4
Vreewijk	0.63	14
Zestienhoven	1.2	7
Zevenkamp	0.82	4
Zuiderpark	0.61	4
Zuidplein	0.54	1
Zuidwijk	0.61	6

Table 3. **Neighbourhoods per social score.**

Neighbourhood social score	Neighbourhood	
City centre	C.S. kwartier	Nieuwe Werk
	Cool	Oude Westen
	Dijkzigt	Stadsdriehoek
	Kop van Zuid	
Low social score	Afrikaanderwijk	Oude Noorden
	Bloemhof	Pendrecht
	Bospolder	Schiemond
	Groot Ijsselmonde	Spangen
	Hillesluis	Tarwewijk
	Katendrecht	Tussendijken
	Lombardijen	Vreewijk
	Nieuw Crooswijk	Zuiderpark
	Nieuwe Westen	Zuidwijk
	Oud Crooswijk	
Average social score	Agniesebuurt	Middelland
	Beverwaard	Noordereiland
	Carnisse	Ommoord
	Delfshaven	Oud Charlois
	Feijenoord	Oud Ijsselmonde
	Heijplaat	Oud Mathenesse
	Kleinpolder	Prinsenland
	Kop van Zuid - Entrepot	Rubroek
	Kralingen West	Zevenkamp
	Liskwartier	Zuidplein
High social score	Bergpolder	Nesselande
	Blijdorp	Oosterflank
	De Esch	Overschie
	Het Lage Land	Provenierswijk
	Hillegersberg Noord	‘s Gravenland
	Hillegersberg Zuid	Schiebroek
	Kralingen Oost	Struisenburg
	Kralingseveer	Terbregge
	Molenlaankwartier	Zestienhoven

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